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NOTES ON GEOGRAPHIC DISTRIBUTION

Amphibia, Anura, Hylidae, *Phyllomedusa azurea* Cope, 1862: Distribution extension to southern Brazil

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ABSTRACT: This note reports the presence of *Phyllomedusa azurea* Cope, 1862 in municipality of Água Doce, state of Santa Catarina, southern Brazil, extending *ca.* 690 Km to the south the known distribution of this species. If we consider the wide distribution of *P. azurea* and the morphologic differences between specimens from northern and southern populations, it is possible that it could be in reality a species complex.

Phyllomedusa azurea Cope, 1862 is a species recently revalidated and included in *Phyllomedusa hypochondrialis* group as defined by Caramaschi (2007 "2006"), with other nine species: *P. araguari* Giaretta *et al.* 2007; *P. ayeaye* (B. Lutz, 1966) (with *P. itacolomi* Caramaschi, Cruz and Feio, 2006 as junior synonymous, see Baêta *et al.* 2009); *P. centralis* Bokermann, 1965; *P. hypochondrialis* (Daudin, 1800); *P. megacephala* (Miranda-Ribeiro, 1926); *P. nordestina* Caramaschi, 2006; *P. oreades* Brandão, 2002; *P. palliata* Peters, 1873 "1872"; and *P. rohdei* Mertens, 1926 (Giaretta *et al.* 2007; Caramaschi *et al.* 2006; Caramaschi 2007 "2006"; Brandão and Álvares 2009; and Baêta *et al.* 2009).

Phyllomedusa azurea is characterized by: (1) medium size for the group (CRC 31.2 - 43.3 mm in males, 42.4 - 44.4 mm in females); (2) presence of a narrow white stripe on the upper lip, which do not reaches the boarder of the inferior eyelid and is not visible in a dorsal aspect of the head; (3) presence of vertical dark bars contrasting with a red-orange background on the hidden sides of the flanks and limbs; (4) presence of a wide green stripe along all the extension of the upper surface of thighs; (5) lack of a reticulate pattern on the eyelids, lips, and inferior surfaces of body and limbs; (6) lack of a whitish stripe on lateral surfaces of the body and posterior surface of the tibia (Caramaschi 2007 "2006").

The type locality of *P. azurea* is unknown, mentioned simply as 'Paraguay' in original description. Its occurrence is recorded in the regions of Chaco, east of Bolivia, from Paraguay to northern Argentina, Cerrado and Pantanal in Central Brazil in the states of Mato Grosso, Mato Grosso do Sul, Tocantins, Goiás, Distrito Federal, Minas Gerais and São Paulo (Caramaschi 2007 "2006"; Prado *et al.* 2008; Frost 2009), and recently from a transitional region between the Cerrado and the Amazonian Forest biomes in state of Rondônia, in northern Brazil (Calderon *et al.* 2009). This species is typical from open habitats. During its reproductive season it can be found mainly in swampy

FIGURE 1. New record of *Phyllomedusa azurea* in the (1) municipality of União Paulista, state of São Paulo (Prado *et al.* 2008), (2) municipality of Água Doce, state of Santa Catarina (present study), and (3) municipality of Porto Velho, state of Rondônia (Calderon *et al.* 2009). The stripped area corresponds to the species geographic distribution proposed by Angulo (2008).

areas dominated by herbaceous vegetation, in heights that varies from ground level to 2.5 m (Freitas *et al.* 2008).

On 8 January 2009, near 20:00 h, we recorded *ca.* 20 individuals of *Phyllomedusa azurea* in municipality of Água Doce (26°35'59.9" S, 51°34'39.4" W; 1,330 m above sea level), state of Santa Catarina, Brazil (Figure 1). Individuals of *P. azurea* were found on herbaceous vegetation along the shore of an artificial pond. This pond was located in an open area under anthropic influence (pasture). On that

occasion, most of the observed individuals were calling, which coincides with the peak of calling activity (between 20:00 h e 21:00 h) described by Freitas *et al.* (2008). This record extends *ca.* 690 km to the south the known geographic distribution of this species in Brazil.

Three specimens were collected (all males) and their color pattern (Figure 2) is in accordance to the general pattern described by Caramaschi (2007 "2006"), except by the following aspects: (1) absence of the dorsolateral whitish stripe limiting the green dorsum, from the mouth corner until the groin, as well as the black line under the white one; (2) presence of a continuous orange stripe along the lateral part of the body, from the posterior boarder of the tympanum and forearm until the inguinal region, such stripe presenting a smooth reticulate pattern of dark color; 3) the green stripe on the dorsal surface of the thigh presents discontinuity (U. Caramaschi, pers. com.).

The mean snout-vent length of the three collected males (35.7 ± 1.78 mm; Table 1) was slightly inferior to the means presented by Caramaschi (2007 "2006"; 37.7 mm) and Freitas *et al.* (2008; 36.45 mm), but is still included between the extreme values recorded by these authors. All the measurements of *P. azurea* taken in this study corroborate those of Caramaschi (2007 "2006") and Freitas *et al.* (2008), except by the head length that was slightly inferior to the values recorded by Caramaschi (2007 "2006"; Table 1). Examined specimens are housed in the Coleção Herpetológica da Universidade Federal de Minas Gerais (UFMG 3222) and Coleção de Anfíbios da Universidade Comunitária da Região de Chapecó (CAUC 0864; CAUC 0865).

If we consider the location of the most recent records for this species in north (Calderon *et al.* 2009) and south (this paper), as well as the morphologic differences observed in the pictures presented by those authors, we cannot discard the hypothesis that *P. azurea* could be in reality a species complex. However, only a widest review could solve this question, and this is not the purpose of this paper.

The region where the study area is located has the highest altitude of the southern Brazilian planaltic fields, and lies at the limit between the Iguaçu and Uruguai River basins. The landscape is mainly constituted by native grasslands, but also includes swampy areas and patches of mixed ombrophilous forest (Bencke *et al.* 2006). This distribution extension represents the first record of *P. azurea* outside the savanna type formations of Cerrado, Pantanal and Chaco biomes, where the species had been previously recorded (Caramaschi 2007 "2006"; Prado *et al.* 2008; Freitas *et al.* 2008; Frost 2009; Calderon *et al.* 2009). The physiognomic vegetation of the area is very similar to other planaltic fields in southern Brazil ("Campos de Cima da Serra" in northeastern state of Rio Grande do Sul and "Campos do Planalto das Araucárias" in southeastern state of Santa Catarina) (Bencke *et al.* 2006) considered as inside Campos Sulinos biome (MMA 2000). The regional climate is classified as Cfb (temperate) according to Köppen system, with accentuated dry and cold winters (IAPAR 1978). Geologically, the region is characterized by shallow soils, with sandy rocks covered by basaltic layers. Such rock composition originates very acid soils, allowing the development of bogs in many areas (Maack 1947; Klein 1978).

The grasslands where *P. azurea* was recorded are considered by the Brazilian Environmental Ministry (MMA) as an area of high importance and priority for the conservation of the Atlantic Forest biome (MMA 2007; Figure 3). Since the end of the 1990's, the pressure over these areas have increased due to the occupation by agriculture and exotic pine plantations (Bencke *et al.* 2006), threatening its biodiversity.

The present record of *P. azurea* highlights the scarcity of knowledge about the anurofauna from the grasslands of the southern Brazil. Besides the unquestionable impacts of grasslands modification, deforestation can also be promoting changes in anuran distribution, favoring the expansion of the geographical range of species typical from open habitats, as *P. azurea*. In this way, intensive and wide-ranging studies in that area, as well in similar formations in south Brazil are needed, to produce a better assessment of the species distribution pattern and conservation status.

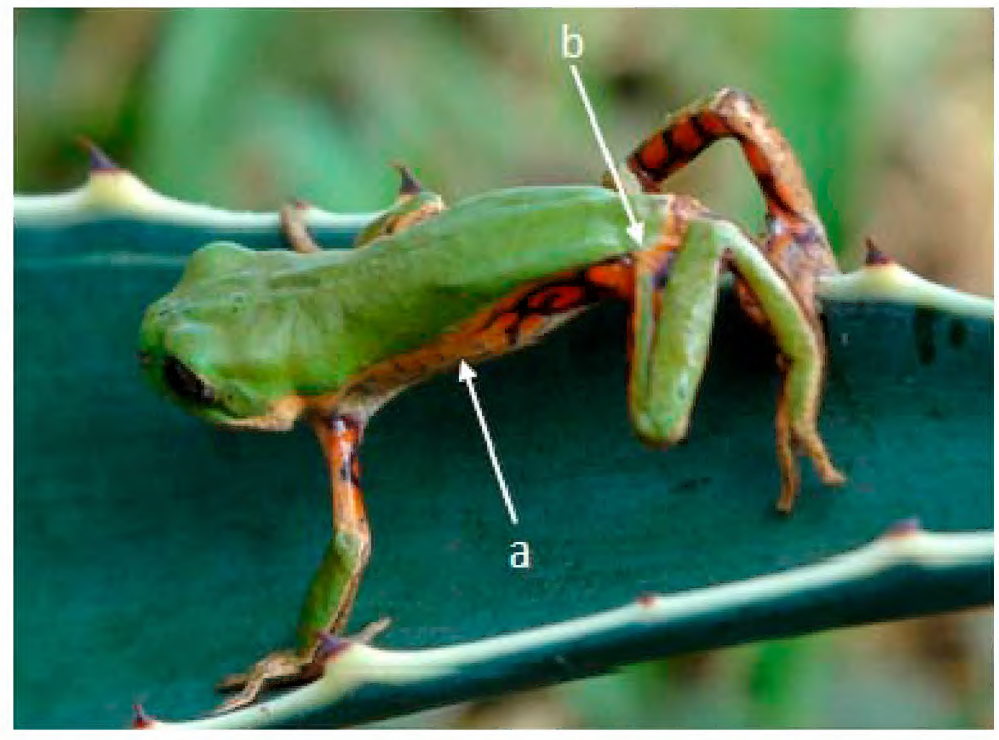

FIGURE 2. *Phyllomedusa azurea* collected in the municipality of Água Doce, state of Santa Catarina, Brazil. The arrows indicate characteristics that differ from the original pattern described by Caramaschi (2007 "2006"): (a) the reticulate pattern of flanks and thighs, (b) discontinuity in the green stripe. Photo by Eliara S. Müller.

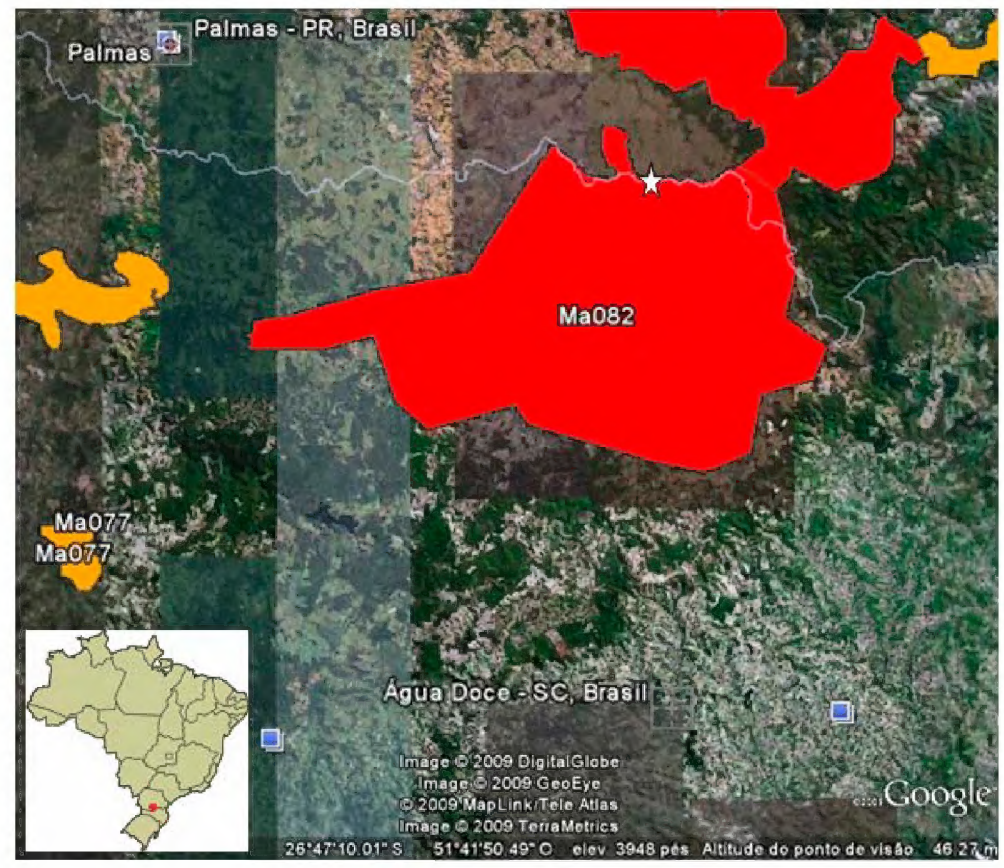

FIGURE 3. The new record of *Phyllomedusa azurea* (star), located in an area with high priority for conservation in the Atlantic Forest biome (Ma082: Campos de Água Doce) according to the Brazilian Environmental Ministry (MMA 2007).

Table 1. Morphometric measurements of the tree collected males of *Phyllomedusa azurea* in the municipality of Água Doce, state of Santa Catarina, Brazil, and measurements of males reported by Freitas *et al.* (2008) and Caramaschi (2007 "2006"). The mean ± standard deviation and range are showed in mm.

Characters	Present Study	Freitas *et al.* (2008)	Caramaschi (2007 "2006")
	N = 3	N = 48	N = 30
Snout-vent length	35.70 ± 1.78 (33.67 - 37.01)	36.45 ± 2.06 (32.99 - 41.70)	37.7 ± 2.84 (31.2 - 43.3)
Body width	8.40 ± 0.38 (8.09 - 8.83)	7.99 ± 2.26 (2.77 - 13.59)	--
Body height	7.16 ± 0.14 (7.08 - 7.32)	6.53 ± 1.23 (3.74 - 9.05)	--
Head length	12.26 ± 0.83 (11.73 - 13.22)	13.00 ± 1.92 (3.29 - 16.70)	10.0 ± 0.54 (8.6 - 10.9)
Head width	11.26 ± 0.52 (10.94 - 11.86)	10.71 ± 1.06 (7.24 - 14.11)	11.0 ± 0.69 (9.2 - 12.1)
Head height	9.11 ± 0.45 (8.66 - 9.55)	6.74 ± 1.54 (3.95 - 12.06)	--
Tympanum diameter	2.02 ± 0.11 (1.92 - 2.14)	1.86 ± 0.36 (1.02 - 2.75)	1.9 ± 0.19 (1.5 - 2.2)
Interorbital distance	4.00 ± 0.78 (3.13 - 4.64)	5.99 ± 0.90 (1.49 - 7.43)	4.0 ± 0.26 (3.5 - 4.5)
Eye-nostril distance	2.78 ± 0.15 (2.63 - 2.92)	2.59 ± 0.31 (1.76 - 3.31)	2.6 ± 0.20 (2.2 - 3.0)
Eye diameter	4.08 ± 0.10 (3.97 - 4.17)	3.73 ± 0.68 (1.44 - 5.29)	3.8 ± 0.22 (3.3 - 4.3)
Internasal distance	3.65 ± 0.34 (3.27 - 3.93)	3.16 ± 0.36 (2.25 - 3.83)	3.4 ± 0.31 (2.7 - 4.1)
Arm length	8.31 ± 0.19 (8.12 - 8.49)	7.86 ± 1.29 (2.64 - 9.61)	--
Arm width	1.65 ± 0.10 (1.56 - 1.75)	1.65 ± 0.36 (0.90 - 2.60)	--
Forearm length	9.07 ± 0.20 (8.93 - 9.29)	8.99 ± 0.79 (7.22 - 10.53)	--
Forearm width	3.05 ± 0.55 (2.64 - 3.67)	2.50 ± 0.54 (1.04 - 3.80)	--
Hand length	8.94 ± 0.42 (8.52 - 9.36)	8.52 ± 1.24 (2.24 - 10.51)	--
Thigh length	14.04 ± 1.12 (12.74 - 14.72)	12.49 ± 1.50 (9.36 - 15.75)	15.1 ± 0.94 (12.9 - 16.8)
Thigh width	3.53 ± 0.53 (2.92 - 3.88)	3.22 ± 0.73 (1.36 - 4.90)	--
Tibia length	13.68 ± 0.49 (13.19 - 14.16)	14.05 ± 1.35 (10.29 - 17.09)	15.0 ± 1.01 (13.0 - 17.3)
Tibia width	2.91 ± 0.28 (2.65 - 3.20)	2.48 ± 0.54 (1.11 - 3.39)	--
Foot length	20.99 ± 0.76 (20.30 - 21.80)	22.01 ± 1.39 (18.29 - 25.14)	22.3 ± 1.33 (18.9 - 25.1)

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